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IS : 9639 - 1980
(Reaffirmed 1996)

Indian Standard

**CODE OF PRACTICE FOR VISUAL
INSPECTION OF LOW PRESSURE WELDED
STEEL GAS CYLINDERS DURING
MANUFACTURE**

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**BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002**

Indian Standard

CODE OF PRACTICE FOR VISUAL INSPECTION OF LOW PRESSURE WELDED STEEL GAS CYLINDERS DURING MANUFACTURE

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of newly manufactured low pressure gas cylinders marked with a working pressure less than 35 kgf/cm², on the basis of extent of defects revealed by visual inspection.

1.1.1 The limits specified in this standard apply only to newly manufactured cylinders. They do not apply to cylinders already in use. For cylinders in use the following Indian Standards have already been prepared:

IS : 5845-1970 Code of practice for visual inspection of low pressure gas cylinders

IS : 8433-1977 Code of practice for visual inspection of dissolved acetylene cylinders

IS : 8451-1977 Code of practice for visual inspection of high pressure gas cylinders

2. INSPECTION EQUIPMENT

2.1 Exterior corrosion, denting, bulging, gouges or digs are normally measured by simple direct measurement with scales or depth gauges. In brief, a rigid straight edge of sufficient length is placed over the defect and a scale is used to measure the distance from the bottom of the straight edge to the bottom of the defect. There are also available commercial depth gauges which are especially suitable for measuring the depth of small cuts or pits. It is important when measuring such defects to use a scale which spans the entire affected area. When measuring cuts, the upset metal should be removed or compensated for so that only actual depth of metal removed from the cylinder wall is measured.

3. VISUAL INSPECTION OF CYLINDER SHELL AND DISHED ENDS BEFORE ASSEMBLY

3.1 Lamination

3.1.1 Definition — Appearance of successive metallic layers on the cylinder wall.

Limits — Special attention shall be paid to the cut or trimmed edges which may disclose the existence of laminations, shearing, cracks and other objectionable defects. Presence of lamination or cracks indicating the presence of lamination shall be a cause for total rejection. No repair is permissible.

3.2 Sliver

3.2.1 Definition — Portion of metal peeled out due to a defect in the raw material.

Limits — Any sliver present in the cylinder shell and dished ends shall be chipped out or ground flush with parent metal. The actual wall thickness shall not be less than the minimum allowable thickness after chipping or grinding.

3.3 Wrinkle

3.3.1 Definition — Localized undulations or uneven surface similar to corrugations in diameter at the straight portion of the cylinders, halves or dished ends.

Limits — Wrinkles observed in cylinder shell and dished ends shall be accepted if the depth of the wrinkle is 1 mm or less. If the depth exceeds 1 mm, the excess shall be ground and the minimum allowable thickness of cylinder shell and dished ends is to be ensured after grinding for acceptance.

3.4 Isolated Pitting

3.4.1 Definition — Local corrosion not in excess of 6 mm diameter and occurring not more frequently than one in any 50 cm² of the surface.

NOTE — By corrosion is meant corrosion in raw material or semi-finished product due to over-pickling or atmospheric corrosion due to storing in open space for a long time.

Limits — Any pitting in excess of the dimensions stated above shall be ground smooth and minimum allowable wall thickness shall be ensured. The pittings within the dimensions stated in the definition needs no grinding operation.

3.5 Line Corrosion

3.5.1 Definition — When the pittings are not isolated but are connected or nearly connected to others in a narrow band or line, such a pattern is termed as line corrosion. This condition is more serious than isolated pitting.

Limits — Any line corrosion in excess of 6 mm width or more than 50 mm in length shall be ground smooth and minimum allowable wall thickness shall be ensured. The line corrosion within 6 mm width and less than 50 mm in length needs no grinding operation.

3.6 General Corrosion

3.6.1 Definition — General corrosion is that which covers considerable surface areas of the cylinder. It reduces the structural strength. It is often difficult to measure or estimate the depth of general corrosion

because direct comparison with the original wall cannot always be made. General corrosion is often accompanied by pitting.

Limits — The cylinder shell and dished ends shall be rejected when the actual minimum thickness remaining under the area of general corrosion is less than minimum allowable thickness.

3.7 Scale Mark and Scale Pit

3.7.1 Definition — An indentation formed by the scale on the raw material during rolling operation.

Limits — The actual wall thickness remaining under the area of scale pits shall not be less than the minimum allowable wall thickness. The scale pits which can adversely affect the safe working of the cylinder shall be ground smooth and checked for minimum wall thickness.

3.8 Dig

3.8.1 Definition — A sharp impression where the surface material has not been penetrated.

Limits — The defective portion shall be ground smooth and minimum wall thickness shall be ensured. In case of sharp conical dig, cylinder-half is to be rejected.

3.9 Cut (Gouge)

3.9.1 Definition — A sharp impression where the surface material has been penetrated.

Limits — Cylinders shall be condemned when a cut on a cylinder is 75 mm or more in length or the wall thickness is less than three-quarters of the minimum allowable wall thickness.

3.10 Dent

3.10.1 Definition — A blunt impression where the surface material has not been penetrated.

Limits — The affected portion shall be repaired in an approved manner and the profile shall be within the permissible limits of IS : 3196-1974*.

*Specification for welded low carbon steel gas cylinder exceeding 5 litre water capacity for low pressure liquefiable gases (*second revision*).

3.11 Die Mark

3.11.1 Definition — Indentation formed during drawing operation due to foreign particle adhering to the die.

Limits — Die marks which are deeper than 0.5 mm shall be ground smooth and minimum allowable wall thickness shall be ensured.

4. VISUAL INSPECTION OF CYLINDER ASSEMBLY BEFORE WELDING OPERATION

4.1 The surfaces to be welded shall be free from foreign material, such as grease, oil or marking paints for a distance of at least 10 to 20 mm from the weld edges. Irregularities in fusion faces which are likely to affect the quality of welding shall be removed before welding is commenced.

4.2 All tack welding shall have been properly carried out in such a manner that no crack arises in tack welds or in parent material.

5. VISUAL INSPECTION OF WELDS

5.1 All the cylinders before stress-relieving operation shall be inspected and visible defects, such as cracks on welds, pin holes, incomplete fusion etc, shall be repaired by removing the defective welding by grinding, chipping, machining or by any other approved methods to sound metal and re-welding, care being taken to ensure proper penetration and complete fusion of the fresh weld deposit with the sound metal.

5.2 The weld joint shall be free from undercuts but slight intermittent occurrences may be disregarded provided that such undercut is not in the form of a sharp notch (*see* IS : 817-1966*).

5.3 The welds shall have an even finish and shall merge into the parent material without abrupt irregularity.

5.4 The joint in the weld run where welding has been recommended and weld craters at the finished point shall be as smooth as possible and shall show no pronounced lump or recess in the weld surface (*see* IS : 817-1966*).

5.5 Any crack found in the heat affected zone of the parent material shall be a cause for total rejection of the cylinder. No repair is permissible.

*Code of practice for training and testing of metal arc welders (*revised*).

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